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# PUBLIC FORESTRY RESEARCH IN LATIN AMERICA, ITS STATUS AND NEEDS

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# PUBLIC FORESTRY RESEARCH IN LATIN AMERICA, ITS STATUS AND NEEDS

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SUMMARY

Evidence of problems confronting forestry research in Latin America led to a survey of the 16 major institutions. Their research programs were found to be broad and overlapping. Program orientation is weak. Training opportunities are too few. Regional coordination of research is needed, and these institutions appear ready for it. Stronger support of expert advisors, voluntary coordination of programs, and a series of regional training courses are suggested.

The need for forestry research in Latin America is growing. In all countries there are increased efforts to conserve forests and to encourage reforestation and forest-based industries. Success in this depends upon technical practices as yet unperfected. The knowledge that underlies these practices can be acquired only through research.

Forestry research is already widespread in Latin America. In 1964 more than a hundred institutions reported[1/] research in progress or planned. Investigations in 10 or more major fields were reported by 12 institutions. At least 250 investigators were at work. The number of technical publications on Latin America cited by Forestry Abstracts increased 50 percent from 1954 to 1964.

A lack of coordination and efficiency threatens the success of Latin America's forestry research effort. The scarce funds available for research are used to study the same forestry problems at more than one institution. Yet in 1964 the scientists in most of these institutions reportedly[1/] had little access to the results of research done by others or to opportunities for training. Moreover, the following new evidence suggests that these deficiencis persist:

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* In cooperation with the University of Puerto Rico.
1/ FAO/LAFC (CRIF)-64/6

1. Of the literature of interest to forestry scientists in Latin America, about 90 percent is published elsewhere and/or in foreign languages.[2/] Of even the publications directly concerning Latin America (Forestry Abstracts, 1966), about 40 percent are in these categories.

2. Research training within Latin America (Turrialba and Río Piedras) is only beginning and is far from adequate. Of the 53 fellowships in current United Nations Special Fund forestry projects in Latin America,[3/] only two are specifically for research.

3. Latin America's share of the world's publications cited by Forestry Abstracts dropped from 1.5 to 1.4 percent between 1954-56 and 1964-66. Yet of the world's forests, Latin America's share is 23 percent; and of its population, 7 percent. Only one forestry publication per year is cited for every 27,000,000 acres of forest.

## The 1967 Study

To determine in more detail the problems and needs of research, an on-site study was made in 1967 for the Regional Committee on Forestry Research of the Latin American Forestry Commission of FAO. The study covered the institutions responsible for the larger forestry research programs--those most likely to make contributions of regional significance. These included 12 listed by the Committee in 1964,[1/] less one that did not continue a research program as planned, plus five others that now appear important, a total of 16 (Appendix I). Together they serve all of Latin America.

The directors and leading scientists of these institutions were questioned as to programs, progress, problems, and needs. Central facilities were seen. Representative and extreme conditions and viewpoints are reported without appraising or comparing institutions by name.

## Findings

### Scope of programs

Two of the 16 institutions serve all of Latin America. Nine serve entire nations, while five serve regions within national boundaries. All but one perform functions other than

2/ Bol. Biblio. Agricola 3(4):179-205, Turrialba
3/ FAO:NAFC-67/7, Annex 1

forestry research. Four are primarily educational, being units of universities. Seven others assist in teaching forestry. Four are national forestry agencies concerned with broad programs, research being a service branch. Four offer technical assistance to landowners and industries, and three perform extension work.

Thirteen institutions are authorized to undertake research in any field of forestry except where forest hydrology, recreation, wildlife management, and highly specialized industrial investigations, such as paper manufacture, may be assigned to other agencies. In one country two nearby institutions share research responsibilities, one in production and the other in utilization.

The number of institutions which within 18 months of the time of the study have been, or expect to begin, investigating various lines of forestry research is listed in Appendix II. The average number of lines per institution is 14, with extremes of 3 and 25. Of the 16 institutions, nine are engaged both in forest production and in forest products utilization research, five in production only, and two in utilization only. The most widely investigated fields of production are artificial regeneration (13 institutions), ecology (13), dendrology (11), and tending stands (11). Utilization research most commonly covers wood properties (10), seasoning (9), and preservation (7).

## Sources of support

Of the 16 institutions, two are sponsored internationally, ten nationally, three by states, and one privately, although it relies heavily on national support. National support exceeds 50 percent at 13 institutions. Private support nowhere exceeds 15 percent. Of the 14 institutions that are not international, six receive international support through either United Nations Special Fund projects or bilateral programs. At two institutions such support, although not primarily for research, is 50 percent of total funding.

## Direction

The directors of ten of the 16 institutions have professional forestry degrees, and of these, nine have graduate degrees, six being in forestry. The directors appear dedicated to their tasks and sincerely interested in bettering their programs. Less than half of them have had access to training in public administration, executive direction, decision making, personnel management, and other useful elements of research administration.

Program orientation seemed a deep concern of only four of the directors. Orientation generally is initiated, if not

practically decided, by the scientists' plans of work from year to year. In eight institutions these plans are reviewed jointly by the director and the project leaders. Only four institutions have plans which lay out a research program in advance and list studies by priority. Four have program advisory committees composed of outsiders.

Scientific personnel

Scientists of national origin staff seven of the institutions. Seven others employ a few non-citizens but plan to replace them as soon as nationals are considered qualified. Only the two international institutions expect to employ outsiders in the future.

The number of scientists per institution ranges from 2 to 25, averaging 15. Of 244 scientists in all, 110, or 45 percent, work only part-time at research. At five institutions no scientific personnel work full-time on investigation. Part-time investigators spend from 25 to 80 percent of their time on research, averaging less than 40 percent. Sixty percent of the scientists have a degree in forestry and another 20 percent are agronomists. Nearly half of the latter have advanced training in forestry. Agronomists make up the entire scientific staff of two large institutions. Of the 222 native-born scientists, 20 percent have graduate degrees.

Subprofessional research assistants are employed at 14 of the institutions. Students are used where available. Elsewhere, the number of continuously employed subprofessional assistants ranges up to 22, averaging 6 (about one for each two scientist man-years). The best permanent assistants were said to come from schools for forestry technicians.

Fifteen of the directors consider training opportunities for research personnel seriously deficient. Fellowships are reported to be obtainable, at least when an unusually good case can be made, but releasing key personnel is difficult and there is uncertainty as to where to send them. At one large institution almost continuous teaching assignments make absences of even a week for training a serious interruption.

Only one local course in experimental design (this for agricultural research) was reported. Some of the directors appear satisfied with training in elementary statistics for this purpose. Even this training is accessible to only eight institutions. Three attempt to train one scientist as a specialist. Study plans were not reviewed, but senior scientists at two of the larger institutions showed a need for and expressed an interest in obtaining training in experimental design.

The scientists of 14 institutions virtually never participate in the affairs of scientific associations. Few are favorably located, but even where distance is no obstacle, the contributions of forestry personnel reportedly are infrequent.

At four institutions with progressive programs and good prospects for expansion, morale seems high. Under less favorable conditions, whether good scientific personnel are being attracted and retained is uncertain. One director reports losing scientists shortly after they obtain advanced degrees, because of salary differentials apparently beyond administrative control. Another large institution, which seemed to lack adequate career incentives, was said to face concurrent resignations by several scientists prepared to accept lower salaries elsewhere.

Facilities

The directors of 13 of the 16 institutions consider housing adequate for their present scale of operations. Two of those inadequately housed are constructing new quarters. One considers itself poorly located. Three institutions are to be decentralized and will require more housing in the field. Field quarters are generally inadequate. Inadequate vehicular transportation is becoming a major hindrance to the research work of six of the institutions.

The 16 institutions have nine biological laboratories (seed, soils, physiology) three pathology-entomology laboratories, four photogrammetry laboratories, and 24 wood laboratories, including anatomy, physical and mechanical tests, seasoning, preservation, and pulp and paper research. Many also have access to laboratories and scientific equipment appear adequate for proposed research programs.

All the institutions are accumulating libraries. Eight contain more than 4,000 titles of forestry interest. Six institutions are located near university libraries. Forestry Abstracts is currently received in 12 of the libraries. Title cards (Oxford or Reinbek) are received by six, but in only three is classification kept current. Only one complete classified file of Oxford cards (four sets) was found. Floras, maps, and local climatic and soils data are rare in these libraries. One contains specially prepared bibliographies.

The 14 institutions concerned with forest management all have experimental areas, some owned or administered by other agencies. At three institutions the entire local range of site and forest conditions is represented in such areas. No director foresees problems in obtaining more areas as needed.

Collections of specimens for experimental use have been started at all institutions. Twelve have herbaria, of which five include over 2,000 sheets. Eight have begun arboreta of timber species. Ten have wood collections, four of which are being documented with herbarium sheets. Sizable collections of slides for microscopic study of local woods have been built up at three institutions. One institution has a collection of mammal and bird specimens. Collections of forest insects and fungi have been started at five institutions.

Collections of basic data needed for further research are being accumulated at all institutions. Six are collecting data on silvical characteristics of trees, and three on the synecology of undisturbed forest. Five have developed keys for the identification of forest trees. Volume tables have been prepared at six institutions; together they apply to about ten tree species. Seven are accumulating data on wood characteristics, with data on the structure and properties of many species already available at four institutions. Two institutions are official sources of national statistics on commerce in forest products. A third hopes to serve this function.

## Cooperative relationships

Cooperative relationships and coordination of effort among these research institutions are weak. There is a general lack of knowledge as to work currently in progress at neighboring institutions. Infrequency of personal contacts is an important cause. The number of inter-institutional visits for scientific purposes averages less than one per year. Although 27 research institutions in allied fields such as agriculture are close to at least one of the 16, scientific collaboration is limited to seven institutions. In this communications vacuum one public research institution financed to work on food and forage crops (not included in this study) is reportedly performing excellent forest genetics research uncoordinated with any forestry research institution.

The closest ties of these institutions are with forestry schools. Of the 12 not within universities, seven provide part-time instructors for forestry schools. Two institutions within universities exchange faculty members and students with forestry schools in the north temperate zone. Two others are considering this step. The potential effects of these agreements on local research are not yet clear.

## Types of Accomplishments

The older institutions apparently have contributed to current local knowledge about tree identification, the distribution and description of forest types, national forest

resources, regeneration practices, plantation silviculture, logging, milling, seasoning, preservation, processing techniques, and the development of forest products or industries. Those only a year or two old are still indoctrinating a staff to an exacting new task. Success in this, although a preliminary step, may be the equal of other, more spectacular accomplishments. Other institutions are still engrossed in accumulating basic data needed before effective research can begin. Institutions concerned primarily with teaching evaluate their research programs in terms of the scientific environment provided for students. The two international institutions evaluate their research accomplishments partly in widespread dissemination of the results of research from both within and outside the region. All but two of the institutions have developed a series of occasional bulletins or papers. One publishes a journal that appears regularly.

## Outlook of the Directors

The directors are generally optimistic. Those affiliated with universities point out that the universities are growing, receiving increased public support, and giving more emphasis to research. Directors of three institutions are optimistic concerning continued industrial support. Less optimism characterizes the leaders of institutions dependent on increases in overall national or state forestry appropriations for their expansion. The directors of four institutions relying heavily on international support see an uncertain future.

The aspects of forestry most in need of investigation, listed in descending order of the number of directors recommending them are as follows:

1. Wood-use development, including consideration of export markets (9).

2. Artificial regeneration, including conversion of tropical forests, adaptability of exotic species, weed control, and mechanization (5).

3. Tending of stands, particularly thinning of plantations (5).

4. Transport of products, particularly mechanization (4).

5. Forest inventories meaningful in terms of potential end products (3).

6. Costs and returns from all operations, including conversion of natural forest, regeneration, transport, and wood conversion (3).

7. Land utilization, particularly the place of forests in agriculture (3).

8. Forest ecology, including silvicultural characteristics of native trees and ecology of native forests (3).

9. Natural regeneration, including conversion of both tropical and temperate forests by this means (3).

10. Forest hydrology (3).

11. Wildlife management, including protection of vanishing species (3).

12. Forest genetics, including conservation of germ plasm and seed orchards (2).

13. Fire protection (2).

14. Indirect values of forests, particularly forest recreation (2).

15. Forests in the national economy, including the economic importance of self sufficiency (1).

16. Forest soils and dune fixation (1).

17. Tree identification (1).

18. Forest insects and diseases (1).

The institutes' needs, listed in descending order of emphasis by the directors, are the following:

1. Scientific personnel--trained, career-oriented, and well enough paid to make forestry research their only vocation (15 directors). Three directors think that this alone would solve many other problems.

2. An environment of greater prestige, achieved by raising functions of educational institutions to the graduate level, by undertaking industrial research on contract, or through more autonomy (4).

3. Training opportunities for professional personnel already employed (3). One saw a special need for training in research program orientation and experimental techniques.

4. More and better subprofessional help (3). Two directors consider this about as important as overcoming deficiencies in professional personnel.

5. Buildings, equipment, and operating funds (3). One institution reports more than 90 percent of its funds encumbered for salaries, even publications being difficult to finance. Two directors want to decentralize their facilities.

6. Inauguration of graduate training in educational institutions to provide a scientific environment (2). One wanted no research detached from teaching. Another saw a need to revise teaching schedules to free the faculty for training courses elsewhere and for research.

## Conclusions

### The status of research

1. Latin America already has several major institutions with assigned responsibilities and many of the requisites for productive forestry research.

2. These institutions are chiefly national in sponsorship, support, and personnel. Some are within forest services, some are within universities with forestry schools, and some are independent.

3. Other activities, such as teaching, share the attention of nearly all of these institutions with research.

4. Exploration of the nature of local trees, forest conditions, and products, a preliminary to productive research, has absorbed much of the past efforts, which might otherwise have been spent on solving problems.

5. The assignment of priorities to forestry problems for investigation has been opportunistic and much of the research appears to have been empirical.

6. Investigations of the problems selected have been hindered by undertaking too many lines of research concurrently.

7. Notwithstanding excessive program breadth, important lines of research have received insufficient attention. Among these are forest soils, forest hydrology, wildlife management, forest and farm land use, utilization of wood waste, fire protection, timber conversion, pulp and paper

manufacture, composite materials, chemical utilization, grading and marketing of products, and the importance of forests to national economies.

8. The directors of these institutions generally have the academic preparation appropriate for their jobs. Of the scientists, about one fifth have graduate degrees.

9. Facilities for research are not adequate at all of the institutions, but at most of them the facilities could support more research than is in progress.

10. The directors agree as to many of the most important needs of their institutions.

11. The more effective of these institutions have become respected as authoritative local sources of technical information about trees, forests, and their products and benefits. Considering the limitations that have confronted them, great credit is due those responsible.

The environment for coordination

12. The stronger research institutions of Latin America are sufficient in number and so located geographically that they could effectively share in a coordinated program of research on regional forestry problems. Two international research institutions already exist.

13. Most of the forestry problems believed by research leaders in the Latin American countries to be of high national priority for investigation are common to several nations. Thus regional program orientation apparently need not be at the expense of national interests.

14. The research programs of all of these institutions already have much in common, at least as to the types of problems studied, the techniques used, and the kinds of solutions being explored.

Needs

15. Forestry research in Latin America must no longer be looked upon by national governments and international technical assistance agencies as merely a trouble-shooting adjunct to forestry agencies or an exercise for undergraduate teaching, but rather as a spearhead for future forestry development.

16. Forestry research needs clear national assignment and continuous support, first as a primary activity in a single national forestry authority and supplementarily at existing forestry colleges.

17. Forestry scientists need salary levels at least commensurate with those of other fields of research and adequate to encourage career-oriented dedication to forestry research.

18. Research institutions concerned with forestry, agriculture, and technology all need organized cooperation, team efforts, and frequent direct communications among their scientific personnel.

19. Forestry scientists need continuing training opportunities in special subjects such as experimental design and techniques, research administration, and technical report writing. Such training should be made available locally wherever the number of scientists justifies it. If, on the other hand, travel elsewhere is necessary, full financial support is needed to encourage scientists to obtain it.

20. Forestry research, because it requires rare talents and probably will not soon receive adequate local support, can be expected to need international technical assistance of a more specialized kind and for a longer period than other forestry activities. This need must be recognized in the policies and programs of both national governments and international technical assistance agencies.

21. The major forestry research institutions need technical assistance of two forms: (1) general, from long-term staff advisors in matters such as administration, program orientation and formulation, personnel management, development of library and other facilities, and preparation and production of publications; and (2) specialized, from research experts, for the most part on short-term assignments, to advise on specific study techniques, planning, design, and interpretation.

22. The critical importance of mutual respect and friendliness in advisor-counterpart technical-assistance teams, as attested by research leaders in Latin America, needs greater recognition by both national governments and international technical assistance agencies in the selection and prior indoctrination of both members of teams.

23. Voluntary international coordination of forestry research is needed at the major institutions and should be sponsored, fostered, and financed by outside technical assistance agencies to the degree necessary at the outset. The following steps are desirable:

    a. A comprehensive analysis of the forestry problems of Latin America most suited to coordinated investigation, and a suggestion of priorities.

    b. Subsequent meetings of research institution directors at least once each two years and with attendance financed, to develop the indicated coordination voluntarily.

    c. Subsequent periodical technical meetings of groups of scientists working on shared research projects, with attendance fully financed.

24. The programs of the international forestry research institutions in Latin America need to be expanded to guide and share more fully in research on regional problems, to publicize results regionally, and to offer specialized research training.

25. A series of repeated short courses should be inaugurated immediately within Latin America to cover research subjects such as program formulation, administration, project development, personnel management, study planning, experimental design and analysis, techniques, and the preparation of results for publication and use. Such training, fully financed, should be presented sequentially in different regions of Latin America. Leadership should be assumed by outside technical assistance agencies until nationally sponsored training programs become adequate.

## Institutions Included in the Study

1. Instituto de Investigaciones Forestales
   Administración Nacional de Bosques
   Azcuenaga 1344
   Buenos Aires, Argentina

2. Instituto de Ordenación de Vertientes e Ingeniería Forestal
   Escuela Superior de Bosques
   Universidad Nacional de La Plata
   Villa Elisa
   Casilla de Correo No. 3
   Buenos Aires, Argentina

3. Departamento de Pesquisas y Economía
   Instituto Brasileiro do Desenvolvimento Florestal
   Río de Janeiro, Brasil

4. Servico Florestal
   Secretaria da Agricultura, Caixa Postal 1322
   Sao Paulo, Brasil

5. Departamento de Madeiras
   Instituto de Pesquisas Tecnológicas
   Universidad de Sao Paulo
   Caixa Postal 7141
   Sao Paulo, Brasil

6. Escola Nacional de Florestas
   Universidade do Paraná
   Caixa Postal 2959
   Curitiba (Paraná), Brasil

7. Instituto Forestal
   Casilla 3085
   Santiago de Chile

8. Facultad de Ingeniería Forestal
   Universidad Austral de Chile
   Casilla 567
   Valdivia, Chile

9. Programa Forestal, Disciplina de Dasonomía
   Instituto Interamericano de Ciencias Agrícolas
   Turrialba, Costa Rica

(Cont.)

10. Instituto Nacional de Investigaciones Forestales
Subsecretaría Forestal y de la Fauna
Av. Progreso 5
Coyoacán, Mexico, D. F.

11. Instituto de Investigaciones Forestales
Universidad Agraria La Molina y Servicio Forestal y de Caza
Lima, Perú

12. Institute of Tropical Forestry
Forest Service, U. S. Department of Agriculture
Box AQ
Río Piedras, Puerto Rico 00928

13. Instituto Forestal Latino-Americano de Investigación y Capacitación
Apartado 36
Mérida, Venezuela

14. Dirección de Recursos Naturales Renovables
Ministerio de Agricultura y Cría
Caracas, Venezuela

15. Laboratorio Nacional de Productos Forestales
Ministerio de Agricultura y Cría
Apartado Postal 220
Mérida, Venezuela

16. Facultad de Ciencias Forestales
Universidad de Los Andes
Apartado 305
Mérida, Venezuela

Appendix II

Lines of Investigation and Number of Institutions Involved

| Field | Institutions |
|---|---|
| Forest ecology | 13 |
| Artificial regeneration | 13 |
| Dendrology | 11 |
| Tending of stands | 11 |
| Natural regeneration | 10 |
| Forest insects | 10 |
| Mensuration | 10 |
| Wood structure and properties | 10 |
| Forest genetics | 9 |
| Seasoning | 9 |
| Transport of products | 7 |
| Site assessment | 7 |
| Forest increment | 7 |
| Wood preservation | 7 |
| Felling | 6 |
| Forest diseases | 6 |
| Costs and returns | 6 |
| Growth effects on wood properties | 6 |
| Use development | 6 |
| Forest soil improvement | 5 |
| Forest surveying | 5 |

(Cont.)

| | |
|---|---|
| Secondary forest products | 5 |
| Forest climatology | 4 |
| Forest soils | 4 |
| Marketing of forest products | 4 |
| Wood conversion | 4 |
| Land utilization | 4 |
| Forest hydrology | 3 |
| Wildlife management | 3 |
| Arboriculture | 3 |
| Grading | 3 |
| Pulp and paper manufacture | 3 |
| Chemical utilization | 3 |
| Forests in the national economy | 3 |
| Forestry and farming | 2 |
| Utilization of woods waste | 2 |
| Fire protection | 2 |
| Indirect values of forests | 2 |
| Composite materials | 0 |

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